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ABSTRACT

This study was conducted in an effort to determine the value of using Bloom's "Taxonomy of Educational Objectives: Cognitive Domain," along with Sanders' "Classroom Questions: What Kinds," in instructional sessions designed to increase the cognitive level of questioning by preservice classroom teachers. The question posed was: Are student teachers trained in the use of Bloom's "Taxonomy of Educational Objectives: Cognitive Domain" more likely to ask higher cognitive questions and thereby improve student achievement in the classroom? Student teachers were tested and observed before and after they were instructed in the use of Bloom's "Taxonomy" and Sanders' "Classroom Questions." The pre- and post-tests consisted of classification test items from chapters on the six levels of Bloom's "Taxonomy." A modified form of the Teacher Pupil Question Inventory (TPQI) which also incorporates the cognitive levels of Bloom's "Taxonomy" was used as an observation instrument to record student teacher questions. The data were treated with the statistical procedure of a T-test for differences between means on repeated measures to detect significant differences in the levels of cognition for the group of student teachers before and after instruction. The results showed significance favoring the use of Bloom's "Taxonomy." Teachers, as a group, gained in their ability to use higher level questions after instruction, thus improving student achievement as reflected in classroom behavior. (Author)

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A Study of Classroom Questioning Practices by Pre-Service Teachers

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Introduction

Educators have always subscribed to the dictum that teaching for thinking is a primary function of the school. However, less concurrence has existed as to what teaching for thinking implies in teacher behavior and pupil actions. For the purposes of this study, thinking is concerned with the specific tasks of formulating problems, processing information, generating and evaluating ideas (Crutchfield, 1969).

There is wide agreement that teacher questions are the means of triggering pupil replies which evidence thinking behavior. Asking questions has long been accepted as a teaching technique. One of the current emphases in education is the use of "inquiry" techniques. "Inquiry" implies the use of teacher questions structured to enable students to discover information for themselves rather than the use of lecture to provide the information. It is assumed that providing students with experiences designed to enable them to learn to think for themselves will aid in developing the skill of critical thinking which will be reflected in higher classroom achievement.

Using a population of forty (40) ninth grade earth science classes, Ladd (1969) found that group achievement on a post-test was significantly affected by the teacher's inquiry level as determined by teacher questions. Teachers who asked a greater proportion of higher inquiry questions brought about greater change in students as measured by the post-test. Hunkins (1967) reported that an emphasis on analysis and evaluation questions as defined by Bloom (1956), improved the social studies achievement of pupils in the sixth grade. Pupils responding to higher cognitive questions demonstrated significantly higher scores than did pupils receiving lower cognitive questions.

However, other investigators studying teacher behavior in the classroom, Pfeiffer and Davis (1965) and Davis and Tinsley (1967), reported that teachers asked questions which primarily emphasized the recall of factual information. Yet, educators are being admonished to foster critical thinking. If changes are to be made in the behavior of teachers, programs to effect these changes must start during pre-service education and must be continued during in-service activities.

The present study focused upon this needed change in education at the pre-service level. The study emphasized high-level cognitive questioning techniques based on Bloom's Taxonomy of Educational Objectives: Cognitive Domain (1956) and Sanders' Classroom Questions: What Kinds (1966). The purpose of the study was to examine the possibility of raising the cognitive level of questions asked by student teachers who were provided a treatment effect based largely upon Bloom's Taxonomy. More precisely, the question posed was: Are student teachers trained in the use of Bloom's Taxonomy more likely to ask higher cognitive questions, and thereby, improve student achievement as reflected in classroom behavior?

Bloom's Taxonomy is associated with student behaviors represented by intended outcomes of the educational process. The cognitive domain classifies the methods by which an individual thinks as the result of participating in some unit of instruction. Teachers who are provided instruction in the use of the Taxonomy should be able to raise the level of their questioning. The improvement in this portion of their total teaching behavior will likely raise the quality of expected learner outcomes. Also, an emphasis on questioning behavior possibly will make educational goals more relevant to learner outcomes with the use of the Taxonomy.

Sanders (1966) implied that a teacher's ability to formulate structured and sequentially patterned questions is significantly related to his instructional effectiveness. If this is accurate, instructional effectiveness might be determined by examining the nature of a teacher's classroom questions.

Definitions

I. Cognitive behavior refers to the intellectual process involved in any thinking act. According to Bloom (1956) the process may reach different levels of complexity with each level being inclusive, as the cognitive taxonomy is a cumulative and hierarchical system. This is demonstrated in the diagram shown in appendix C. The six intervals in the Taxonomy of Educational Objectives: Cognitive Domain are:

1. knowledge - recall or recognition of information (facts, generalizations);
2. comprehension - a restatement or reorganization of material in a literal manner to show that one understands the essential meaning;
3. application - solving a realistic problem which requires the selection and use of appropriate knowledge and skills;
4. analysis - breaking an idea into its component parts for logical analysis: assumptions, facts, opinions, logical conclusions;
5. synthesis - suggesting answers to a problem that is original, speculative, or creative;
6. evaluation - making a judgment according to explicit criteria (external or internal).

II. Classroom questions refer to any intellectual exercise calling for a response, including both problems and projects (Sanders, 1966).

The Population Sample

The selection of the sample followed a three-step procedure. First, a university was identified which had a teacher education program offering student teaching each quarter.

Second, the academic quarter from which the sample would be selected was identified. The student teacher enrollment at the University of Alabama in Birmingham during the Spring Quarter, 1974 provided an adequate population from which to draw an adequate sample.

Third, thirty (30) student teachers were randomly selected from a total population of ninety (90) students. Two supervisors and the researcher observed these student teachers in various Birmingham City and Jefferson County schools.

The Instrument

A modified form of the Teacher-Pupil Question Inventory (TPQI) developed by the Davis-Tinsley study (1967) was used to record the data. The difference between the form used in this study and the one used in the Davis-Tinsley study is that the latter had nine categories: memory, translation, interpretation, application, analysis, synthesis, evaluation, affectivity and procedure. The modified teacher-pupil question inventory used in this study had six categories based on Bloom's Taxonomy as follows:

1. Knowledge - the one questioned recalls or recognizes information (facts, generalizations);
2. Comprehension - the one questioned answers by merely restating or reorganizing the material in a literal manner to show that he understands the essential meaning;

3. Application - the one questioned solves a realistic problem requiring the identification of the crucial issue or points and the selection and use of appropriate knowledge and skills;
4. Analysis - the one questioned breaks an idea into its component parts for logical analysis: assumptions, facts, opinions, logical conclusions);
5. Synthesis - the one questioned suggests answers to a problem that is original, speculative, or creative;
6. Evaluation - the one questioned makes a judgment according to explicit criteria (external or internal).

The TPQI requires a minimum classroom observation of thirty (30) minutes divided into alternating five-minute periods for each observation. There is no stipulated number of separate observations. The number used varies with the investigator's purpose. In this study, there were two separate observations before treatment and two separate observations after treatment.

At each instance of a question asked by the teacher, the observer decided in which category the question may be classified and marked a tally in a space provided on the observation sheet. Questions were judged on the basis of language used to convey meanings which coincided with the defined categories listed on the "Guide Sheet" developed by Clegg and Others (1968). A copy of the TPQI is included in appendix A and a copy of the "Guide Sheet" appears in appendix B.

In describing how the Taxonomy might be used as a classifying device, Bloom (1956) explained that any behavior related to mental acts or thinking should be classifiable. Thus, classroom questions were considered classifiable by means of the Taxonomy.

Bloom indicated several difficulties that would be encountered is using the hierarchies of the Taxonomy as a classification scheme. One such difficulty was that it did not offer a method of classification which would permit clear and precise distinctions. Because the categories in the Taxonomy are cumulative and inclusive of all categories below any one category as shown in appendix C, a question may erroneously be placed in a category below its intended level. The classification problem was solved by Sanders' (1966) suggestion that a question should be classified at its highest level. That guideline was observed during the analysis of classroom questions in this study.

Another difficulty mentioned by Bloom was that in attempting to classify an objective item the reader must attempt to solve the problem or answer the question and note the mental processes which are involved. It was often necessary for the observers in this study to determine an answer to a question in order to relate the question to the appropriate category in the Taxonomy. For example, if a teacher instructing a class of high school students in the techniques of taking research notes for a term paper offered as part of the instruction three situations in which information from a source should be written in the form of a direct quotation, he might later ask: "What are three situations in which you would quote the words of an author directly?" The observer, attempting to answer this question, noted that he had only to recall the three situations which the teacher had cited earlier in the lesson. He would then code the question in the "knowledge" category.

Because of the difficulty in identifying an appropriate category of the Taxonomy when analyzing questions, an additional indicator of cognition was necessary in the study. Clegg and Others (1968) noted that language has been

a useful indicator for determining the level of cognition in teacher classroom questions. Therefore, the "Guide Sheet" developed by Clegg and Others served as an integral part of the instrument used in this study. An example of how the "Guide Sheet" was used is as follows: In addition to a definition and example of questions for each category in the Taxonomy, the "Guide Sheet" includes "key words" and "typical question words." The key word for knowledge is "remember." One typical question word is "What"? In analyzing the question, "What are three situations in which you would quote the words of an author directly"? the observer noted that it was necessary for him to "remember" the three examples cited by the teacher earlier. He also noted that the question asked began with the question word, "What"? The definition and examples provided for each category, the "key word" and "typical question word" all proved helpful in properly coding the above question into the knowledge category.

Procedure for Gathering Data

Student teachers met for a seminar on the first day of the Spring Quarter, 1974. They were administered a pre-test to determine their knowledge in the use of Bloom's Taxonomy. The test consisted of a list of questions taken from examples given under the six categories of the Taxonomy. The student teachers were instructed to code each question in the proper category: knowledge, comprehension, application, analysis, synthesis, or evaluation. On the basis of performance of this test, students' knowledge of the application of Bloom's Taxonomy was determined. A copy of the test appears in appendix D.

Two supervisors agreed to work with the researcher in gathering observation data. The three observers met for three training sessions using Bloom's

Table I

Observer Classification of Questions

Observer	Question Items											
	1	2	3	4	5	6	7	8	9	10	11	12
A	5*	5	6	6	1	1	2	4	3	2	4	4
B	5	5	6	6	1	1	3	4	4	2	4	4
C	4	5	6	6	1	2	3	4	3	2	4	4

*Classification Categories:

1 Knowledge
2 Comprehension
3 Application
4 Analysis
5 Synthesis
6 Evaluation

Coefficient of Concordance = 0.980

Degrees of Freedom = 11 Chi Square = 32.333 $P < .001$

Taxonomy, Sanders' Classroom Questions: What Kinds, and the "Guide Sheet" developed by Clegg and Others. The Taxonomy and Sanders' texts were read by the observers before the sessions began. In the first two sessions the categories of the Taxonomy were reviewed. Also, questioning techniques offered by Sanders were reviewed. In the third session, observers used the TPQI and Guide Sheet to analyze questions taken directly from Bloom's Taxonomy.

After the sessions, observers were administered the classification test. The purpose for administering the test to the three observers was to ascertain inter-observer reliability. Table I shows the level of agreement among the three observers. Inspection of the table showed that the twelve items in the administered test contained a high level of agreement among observers. The Coefficient of Concordance which measures the degree of relationship among observers' choices was 0.980.

The responses not only showed a high level of agreement, but also showed statistical significance according to the Chi Square analysis used. Chi Square was 32.333. The probability level, $P < .001$, was statistically significant.

Student teachers were placed in the Birmingham City and Jefferson County schools on the second day of the quarter. They observed their cooperating teachers for one week. During the second and third weeks of teaching the three supervisors observed each of the thirty (30) selected student teachers once per week prior to their instruction in the Taxonomy. The TPQI was used to record data for each of the observations. Whenever a question was asked, it was analyzed and coded in the appropriate category: knowledge, comprehension, application, analysis, synthesis, or evaluation. The Guide Sheet developed

by Clegg and Others was placed along side the TPQI and was used by each supervisor to aid in the question analysis.

Each student teacher submitted a schedule of the next week's activities at a seminar which was held each Thursday afternoon. This enabled the supervisors to plan their visits so that verbal interaction was likely to be in process in each class visited. In some cases, however, it was necessary to make several visits in order to secure two spearate observations before students were given the treatment effect.

After the student teachers taught for two weeks, they were instructed in the use of the Taxonomy. In addition to the Taxonomy, Sanders' Classroom Questions: What Kinds was used in the instructional process. The six cognitive levels of the Taxonomy were defined. Examples of questions for each category were cited. The section of the Taxonomy which provides examples of examination questions for each category was thoroughly studied. Sanders' suggestions on questioning techniques were utilized in question sessions. Student teachers formed their own questions while other student teachers categorized them according to the Taxonomy. Students met each afternoon for one week.

During the fifth and sixth weeks of student teaching, students were again observed in the classroom by the same three supervisors who continued to use the TPQI and Guide Sheet to collect data. This gave a total of two separate observations prior to the treatment effect and two separate observations following the treatment effect. There was an over-all total of four separate observations as shown in the following table:

Total Student Teacher Observations

	First Week	Second Week	Total
Pre-Instruction	1 observation	1 observation	2 observations
Post-Instruction	1 observation	1 observation	2 observations
TOTAL			4 observations

Statistical Treatment of the Data

To obtain observer reliability, an analysis was made of the observers' scores on the classification test. This test was designed to measure the observers' knowledge of Bloom's Taxonomy and their ability to properly analyze the cognitive level of teacher classroom questions. The Kendall Coefficient of Concordance procedure was used in this analysis.

Descriptive information for the pre- and post-tests administered the student teachers was tabulated and analyzed. A t-test procedure measured differences between the pre- and post-test scores for knowledge of Bloom's Taxonomy.

The data collected on the TPQI were analyzed by using a t-test for differences between means on repeated measures. This indicated whether a change had been made in the questioning behavior of the group as a whole from the pre-treatment phase to the post-treatment phase.

Analysis of Data

The analyses of data were performed in two steps. The first step consisted of an analysis of the pre- and post-test administered to the thirty (30) subjects in the study. A t-test procedure measured differences between

the pre- and post-test scores for knowledge of Bloom's Taxonomy.

The second step consisted of a comparison of the pre- and post-instruction questions posed by student teachers. The TPQI observation form was used to gather data on the cognitive level of questions asked. A t-test for differences between means on repeated measures analysis was performed on these data. The computer statistics programs SPEC08 and ANOVO2 by Dr. Harry R. Barker, Jr. were used to analyze the data.

Step One - Pre - Post Classification Test Analysis

The thirty (30) student teachers were administered a pre-instruction and post-instruction test. Table II shows the results of both tests. There were twelve (12) questions asked. Inspection of data showed that there was a 3.27 increase from pre-test to post-test mean. This indicated that the student teachers as a group demonstrated increased ability to recognize the cognitive level of questions according to the Taxonomy by 79 per cent. The standard deviation decreased by .29 or 16 per cent, indicating less variation in student group scores after instruction. The t-ratio was 9.03 which was statistically significant at the .001 level.

Student number "14" had no correct responses in the pre-test but had an increase of seven responses in the post-test. Student number "5" scored five correct responses on both the pre- and post-tests. The analysis of data revealed that the group of student teachers correctly categorized more of the test questions after instruction than before instruction.

Step Two - Pre-Post Cognitive Questions Posed by Student Teachers

The TPQI observation form which appears in appendix A was used to collect data on the cognitive level of questions asked by student teachers before and

Table II

Pre-Post Test Scores of 30 Student Teachers on Classification Test of 12 Question Items

Raw Scores

Teachers	Pre	Post	Change
1	3	9	+6
2	3	8	+5
3	5	9	+4
4	5	8	+3
5	5	5	0
6	6	10	+4
7	3	7	+4
8	7	8	+1
9	1	4	+3
10	7	8	+1
11	2	6	+4
12	3	10	+7
13	6	7	+1
14	0	7	+7
15	4	5	+1
16	7	9	+2
17	6	10	+4
18	3	5	+2
19	1	7	+6
20	5	7	+2
21	6	7	+1
22	3	7	+4
23	4	6	+2
24	5	6	+1
25	5	8	+3
26	2	5	+3
27	3	9	+6
28	6	9	+3
29	5	7	+2
30	2	8	+6

Group Measures

	Pre	Post
Mean	4.10	7.36
S D	1.91	1.62

Degrees of Freedom = 29
t-ratio= 9.03
$P < .001$

after instruction in Bloom's Taxonomy. There were two separate observations for each student before and two after instruction. This procedure gave a total of four separate observations for every student. Each student's performance on each occasion was evaluated by scaling the six levels of questions from 0 - 5. Thus, for example, teacher number eight before instruction asked six knowledge questions, rated 0, and five comprehension questions rated 1 for a total of 5 points. After instruction, the same teacher asked seven knowledge questions, rated 0, eight comprehension questions rated 1, four application questions rated 3, and one synthesis question rated 4, making a total of 24 points. By this method of scoring, teacher eight gained 19 points.

The performances of the other twenty-nine (29) teachers were evaluated in the same manner. A t test for differences between means on repeated measures yielded a t ratio of 1.89, which was significant at the .05 level. Student teachers, as a group, gained not only in their ability to recognize the various cognitive levels of questions, but in their ability to use higher level questions as well.

Inspection of table III showed also that there was an increase in the frequency of questions for each category after instruction. The greatest increase was shown in category four, analysis. The frequency of questions increased from two, before instruction to eight after instruction, thus showing an increase of six or 300 per cent. The category which showed the least increase from pre-instruction to post-instruction was category one, knowledge. In this category, eighty-nine (89) questions were asked before instruction and ninety-five (95) after instruction. This showed an increase of six questions, or 6.7 per cent. The frequency increase shown in other categories follows:

Category two, comprehension, showed an increase of thirty-five (35), from seventy-five (75) to one hundred and ten (110), or 46 per cent. Category three, application, showed an increase of two, from twenty-three (23) to twenty-five (25), or 8.7 per cent. Category five, synthesis, showed a frequency increase of one, from four to five, or 25 per cent. Category six, evaluation, showed a frequency increase of six, from six questions to twelve (12) questions, or 100 per cent. These figures revealed that the level of questions increased after instruction. There was an increase at each level.

Conclusions

On the basis of the data collected by means of the devised scheme and analyzed by the statistical procedure of a t test for differences between means on repeated measures, the following conclusion was drawn: Instruction in the use of Bloom's Taxonomy, and Sanders' Classroom Questions: What Kinds makes a difference in the cognitive question asking behavior of student teachers. When observations of student teachers' questioning patterns were compared before and after instruction, there was a significant difference ($P < .05$) in the level of cognitive classroom behavior achieved after they had been instructed in the use of the Taxonomy. Thus, it was suggested that student teachers who have training in the use of the Taxonomy, along with Sanders' text on questioning strategies achieve higher cognitive classroom behavior.

These results correspond with those reported by Hunkins (1967) and Farley (1968). All three studies found higher cognitive achievement as a result of employing the Taxonomy. It seems desirable, therefore, that the classroom teacher have a knowledge of the Taxonomy, along with Sanders'

Table III

Frequency of Questions Asked at the Different Cognitive Levels

Teacher	Pre-Instruction						Post-Instruction					
	1*	2	3	4	5	6	1*	2	3	4	5	6
1	2	2	4	0	0	1	3	5	0	0	0	0
2	3	2	0	0	0	0	4	6	0	0	0	0
3	6	0	0	0	0	0	4	5	0	0	0	0
4	0	3	5	0	0	0	3	6	0	0	0	0
5	0	0	0	0	2	0	4	0	0	0	0	0
6	4	0	0	0	0	0	3	5	3	0	0	0
7	5	3	0	0	0	0	4	4	0	0	0	0
8	6	5	0	0	0	0	7	8	4	0	1	0
9	0	4	0	0	0	0	0	8	0	0	0	0
10	5	0	0	0	0	0	6	4	0	0	0	0
11	4	3	0	0	0	0	4	5	0	0	0	0
12	2	1	0	0	0	0	0	3	1	0	0	0
13	4	2	0	0	0	0	3	2	0	0	0	0
14	3	0	0	0	0	0	2	2	0	0	0	0
15	4	2	1	0	1	1	3	4	6	2	0	2
16	0	0	3	2	1	4	0	0	5	3	2	5
17	5	3	0	0	0	0	6	7	4	0	0	0
18	2	8	0	0	0	0	9	4	0	0	0	0
19	4	4	0	0	0	0	2	1	0	0	0	1
20	3	1	0	0	0	0	1	3	2	0	0	0
21	0	0	10	0	0	0	2	2	0	0	0	0
22	4	4	0	0	0	0	5	0	0	0	0	0
23	6	4	0	0	0	0	4	3	0	0	0	0
24	0	5	0	0	0	0	2	2	0	0	0	0
25	2	6	0	0	0	0	2	0	0	0	0	0
26	3	3	0	0	0	0	5	5	0	0	0	4
27	5	5	0	0	0	0	4	6	0	2	1	0
28	4	2	0	0	0	0	2	2	0	0	0	0
29	2	0	0	0	0	0	1	3	0	0	0	0
30	1	3	0	0	0	0	0	5	0	1	1	0
Totals	89	75	23	2	4	6	95	110	25	8	5	12

*Classification Categories:

1 Knowledge
2 Comprehension
3 Application
4 Analysis
5 Synthesis
6 Evaluation

Group Measures

Pre	Post
Mean 6.63	Mean 9.77

Degrees of Freedom = 29
t-ratio = 1.89
$P < .05$

questioning techniques and be instructed in their use as tools for raising the cognitive level of classroom behavior.

TEACHER PUPIL QUESTION INVENTORY
(TPQI)

Teacher_____ Date Observed_____

Grade Level_____

Lesson Objective_____

1. Knowledge
2. Comprehension
3. Application
4. Analysis
5. Synthesis
6. Evaluation

Indicate the level of question by using a tally for the appropriate Bloom cognitive category.

	1	2	3	4	5	6
(First Five Minutes) Teacher's Questions						
Student's Response						
(Second Five Minutes) Teacher's Questions						
Student's Response						
(Third Five Minutes) Teacher's Questions						
Student's Response						
(Fourth Five Minutes) Teacher's Questions						
Student's Response						
(Fifth Five Minutes) Teacher's Questions						
Student's Response						
(Sixth Five Minutes) Teacher's Questions						
Student's Response						

Total Teacher Questions _____

Total Student Responses _____

Appendix B

Guide Sheet

Category	Key Word	Typical Question Words
1. KNOWLEDGE (Any question, regardless of complexity, that can be answered through simple recall of previously learned material.) e. g. "What reasons did Columbus give for wanting to sail west to find a new world?"	Remember	1. Name 2. List; Tell 3. Define 4. Who? When? What? 5. e.g. "Did...? Yes or "Was...? No "Is ...? Questions 6. How many? How much? 7. Recall or identify terminology 8. What did the book say?
2. COMPREHENSION (Questions that can be answered by merely restating or reorganizing material in a rather literal manner to show that the student understands the essential meaning.) e.g. "Give the ideas in your own words."	Understand	1. Give an example... 2. What is the most important idea? 3. What will probably happen? 4. What caused this? 5. Compare. (What things are the same?) 6. Contrast. (What thing are different?) 7. Why did you say that? 8. Give the idea in your own words.
3. APPLICATION (Questions that involve problem solving in new situations with minimal identification or prompting of the appropriate rules, principles, or concepts.) e.g. "How big an air conditioner would you need for a room this size?"	Solve the Problem	1. solve 2. How could you find an answer to...? 3. Apply the generalizat to.....
4. ANALYSIS (Questions that require the student to break an idea into its component parts for logical analysis: assumptions, facts, opinions, logical conclusions, etc.) e.g. "Are the conclusions supported by facts or opinion?"	Logical Order	1. What reasons does he give for his conclusions? 2. What method is he using to convince you 3. What does the author seem to believe? 4. What words indicate or emotion? 5. Does the evidence gi support the conclusi
5. SYNTHESIS (Questions that require the student to combine his ideas into a statement, plan, product, etc. that is new for him.)	Create	1. Create a plan... 2. Develop a model... 3. Combine those parts.

6. EVALUATION (Questions that require the student to make a judgment about something using some criteria or standard for making his judgment.)	Judge	1. Evaluate that idea in terms of... 2. For what reasons do you favor... 3. Which policy do you think would result the greatest good f the greatest numbe

Appendix C

Levels of Cognitive Behavior

KNOWLEDGE	COMPREHENSION	APPLICATION	ANALYSIS	SYNTHESIS	EVALUATION
(ability to recall, to bring to mind the appropriate material)	(ability to apprehend what is being communicated and make use of the idea without relating it to other ideas or material or seeing fullest meaning	(ability to use ideas, principles, theories in new, particular, and concrete situations)	(ability to break down a communication into constituent parts in order to make organization of the whole clear)	(ability to put together parts and elements into a unified organization or whole)	(ability to judge the value of ideas, procedures, methods using appropriate criteria)
Requires Knowledge	Requires knowledge	Requires comprehension	Requires application	Requires analysis	Requires synthesis
		Requires knowledge	Requires comprehension	Requires application	Requires analysis
			Requires knowledge	Requires comprehension	Requires application
				Requires knowledge	Requires comprehension
					Requires knowledge

LEVELS OF COGNITIVE BEHAVIOR*

* Marjorie Brown, ed. Home Learning Experiences, Minneapolis: Burgess Publishing Co., 1963. p.12.

Appendix D

CLASSIFICATION TEST

Place the following questions in the proper category:

1. Knowledge
2. Comprehension
3. Application
4. Analysis
5. Synthesis
6. Evaluation

____ 1. Is there a need for a junior college in our community?

____ 2. What principles or standards can you devise that would be helpful in determining which of the above questions should be decided by collective bargaining?

____ 3. Which country-Greece or England-in your opinion, developed ideas that have been the most valuable to us?

____ 4. Would you favor strict laws requiring all farmers to practice soil conservation? Give reasons for your answer.

____ 5. When was the Monroe Doctrine announced?

____ 6. About what proportion of the population of the United States is living on farms?

____ 7. X and Y can do a piece of work together in 15 days. They work together for 6 days; then X quits and Y finishes the work in 30 more days. In how many days can Y do the piece of work alone?

____ 8. When a beggar justifies his begging by the claim that the world owes him a living, how is he behaving?

a. Like a psychotic person
b. Showing a paranoid symptom
c. Having an hallucination
d. Making a typical infantile reaction
e. Rationalizing

____ 9. Suppose an elevator is descending with a constant acceleration of gravity "g". If a passenger attempts to throw a rubber ball upward, what will be the motion of the ball with respect to the elevator?

____ 10. What does the metaphor, "She is a fen of stagnant waters" indicate that Wordsworth felt England was?

"For what men say is that, if I am really just and am not also thought just, profit there is none, but the pain and loss on the other hand is unmistakable. But if, though unjust, I acquire the reputation of justice, a heavenly life is promised me. Since then appearance tyrannizes over truth and is lord of happiness, to appearance I must devote myself. I will describe around me a picture and shadow of virtue to be the vestibule and exterior of my house; behind I will trail the subtle and crafty fox."

____ 11. Which line best states the major premise of the argument?

____ 12. Which line best states the conclusion of the argument?

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